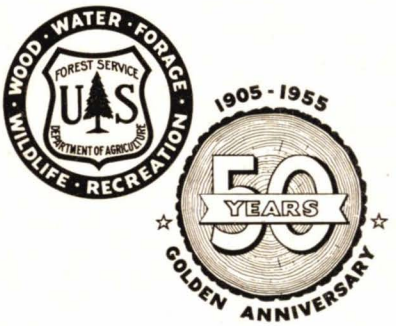
SD11
A10
1955
c.1

Report of the Chief of the Forest Service, 1955



United States Department of Agriculture

LIBRARY
OCT 18 1967
ROCKY MOUNTAIN STATION

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., October 1, 1956.

HON. EZRA TAFT BENSON,
Secretary of Agriculture.

DEAR MR. SECRETARY:

I take pleasure in transmitting my 1955 annual report.

The last annual report of the Forest Service was for 1953. With the exception of 1954, the Forest Service has prepared an annual report each year since its establishment in 1905. I am pleased that these reports are being resumed with this one for 1955. Initial work on the 1956 report has already begun.

Since the last report in 1953, significant progress has been made in forest conservation. As a contributor to this progress, the Forest Service appreciates the strong support we have enjoyed from your office and the Congress.

Increased appropriations for the national forests and for research have enabled us to do a better job. Timber management has been stepped up with accompanying increase in timber sales. Many miles of timber-access roads have been built. An important amendment to the mining laws enables us to improve our management of surface resources without interfering with mineral activity. Progress has been made toward improved facilities for recreation on the national forests.

The Forest Service has nearly completed a 3-year survey of the Nation's timber resources and prospective future demand for timber products. This is the most complete "state-of-the-Nation" appraisal of timber resources that has ever been made.

Many problems remain. Many national-forest watersheds should be in better condition. Tree planting and range and watershed reseeding are far below needs. Our increase in population places steadily growing pressures on the national forests. The needs for water, timber, and forage, for recreation, for wilderness areas, and for hunting and fishing, mount constantly. This places our multiple-use principle of management under severe strain, and tests our skill in both resource management and human relations.

The timber-resource survey shows unquestionably that farmers—over 3 million of them—are the largest single group of forest-land owners. Together with other small forest owners, they own over half of our forest land. Here lies the key to our Nation's future timber supply as well as a largely untapped source of supplemental income to the farmer. The generally poor condition of farm forests indicates that cooperative partnership programs between the farmer, the State, and the Federal Government need to be stepped up. Forest industries, the chief market for products from these small forests, also have an important stake in these programs.

The Forest Service is in sound condition and its morale is high. Nineteen hundred and fifty-five was our Golden Anniversary year. As the Forest Service enters its second 50 years, it looks to the past with pride and to the future with confidence.

Sincerely yours,

Richard E. McArdle

RICHARD E. MCARDLE,
Chief, Forest Service.

CONTENTS

	Page
The national forests	2
Timber management an important job	2
Progress in timber access road program	2
Record cut of timber	2
Forest pests troublesome	3
Water—one of the national forests' most valuable crops	3
Managing national-forest rangelands for best use	4
National forests provide wildlife habitat	4
Recreation use on national forests increasing	5
Other land uses on the national forests	5
Fire control on the national forests	6
The 1955 season	6
Expanding use of aircraft in fire control	6
The smokejumpers in 1955	6
National-forest properties	6
Land utilization projects	7
Forest Service cooperation in State and private forestry	8
Cooperative forest management	8
General forestry assistance	8
Cooperative pest control	8
Cooperative tree planting	8
Watershed protection and flood prevention	9
Cooperative fire control	9
Cooperative fire prevention	10
Forest research	10
Forest management research	10
Forest tree improvement	10
Better planting methods	10
Naval stores production	11
Managing northern hardwoods	11
Watershed management research	11
Forest fire research	11
Range management research	11
Forest insect research	12
Forest disease research	12
Forest products research	12
New products and additional uses for wood	13
Paints and finishes for houses	13
Broadening the raw-material base for newsprint	13
Cooperation with military agencies	13
Forest economics research	13
Administrative management and fiscal control	13
Consolidations	14
Personnel	14
Training	14
Safety	14
Fiscal control	14
Statistical tables	16

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 20 cents

Report of the Chief of the Forest Service, 1955

The Forest Service observed its 50th year of existence in 1955. In addition to marking the golden anniversary of its establishment, the Forest Service saluted State forestry departments, forest industries, forest schools and colleges, conservation organizations, and all forest-land managers—private and public alike—who helped to make noteworthy progress in forest conservation and development during the past half century.

National-forest activities in 1955 included supervising a record cut of 6.33 billion board-feet and making some 27,500 new timber-sale contracts; grazing some 1.1 million cattle and 2.8 million sheep and their offspring less than 6 months of age under 19,700 permits; accommodating 45.7 million recreation visits including 11 million visits from hunters and fishermen; administering 55,000 special-use permits for summer homes, resorts, telephone lines, water developments, mineral leases, and other purposes; suppressing 8,173 fires on or adjacent to national forests; planting 55,600 acres of forest land; reseeding 54,200 acres of rangeland; building 767 miles of roads; and maintaining about 193,000 miles of existing roads and trails.

Through its cooperative activities with States and private owners, the Forest Service participated in protecting 387 million acres of non-Federal forest land from fire; cooperated with 44 States in the production of 519 million tree seedlings in 90 State nurseries and the planting of 704,000 acres; provided technical assistance to 35,000 forest-land owners in 38 States who own or control nearly 2.9 million acres.

In addition, 2.2 million acres were sprayed in order to control spruce budworm; most of this was on western national-forest lands. White pine blister rust control work was done on 827,000 acres of State, private, and Federal lands in 1955.

Since the last annual report in 1953, Congress enacted 31 laws of particular applicability to Forest Service activities. Two of these deserve special mention. One clarified administrative jurisdiction of 462,000 acres of forest land in southwestern Oregon which had been in dispute between the Departments of Agriculture and the Interior. The act provided for continued administration by the Secretary of Agriculture, specified how revenues were to be handled, and eliminated the administration of intermingled sections of forest land by the Forest Service and the Bureau of Land Management. The second act amended the general mining laws. The President stated when he signed the bill that it was one of the most important conservation measures affecting public lands that had been enacted in many years. The act protects the rights of miners but at the same time permits effective management of the surface resources of mining claims, prior to patent, on the national forests and other Federal lands.

One of the most significant accomplishments in 1955 was the completion of the preliminary report from the Timber Resource Review. This was the most complete survey ever undertaken of the Nation's timber situation and prospective future demands for timber products. It was conducted in collaboration with States, forest industries, and other Federal agencies. The report shows that much progress has been made on many forestry fronts. It shows that growth is increasing and that productivity is fairly high on industrial and publicly owned forests. It shows that future demands for timber products may be twice our 1952 consumption and that if needs of our prospective population are to be met, growth will have to be raised to double that of present levels.

The report points out many opportunities for improvement; e. g.: One-fourth of our forest land is poorly stocked, but 50 million acres can be planted; methods can be developed for using much of the one-fourth of our timber cut now wasted; increased protection and salvage efforts can save part of the timber killed by destructive agents, which equals one-fourth of what we grow; growth can be increased materially, especially on over half of our commercial forest land held in small private ownerships, now much less productive than other lands; the declining trends in timber quality can be reversed.

The timber we will need in the future can be grown if there is great intensification of forestry on both public and private lands within the next two decades. To reach the needed growth levels will mean that all forest land needs to be managed as well as the better managed lands are today.

As the Forest Service enters its second half-century, one of the biggest forestry jobs is to raise the level of productivity on the 4½ million small private forest ownerships, over 3 million of which are on farms. About half of these ownerships are less than 30 acres each. Together small ownerships account for over half of the productive forest land in the Nation. Generally, these lands are in poor condition. The most important key to our future timber supply lies with the 265 million acres of small forest tracts owned by 1 out of every 10 American families.

There is a tremendous job, too, on the national forests and in research. Much more intensive management of all renewable resources—water, timber, forage, wildlife, and recreation—is imperative if the national forests are to serve the needs of our expanding population to their full potential.

The three major fields of Forest Service responsibility reported here are administration of the national forests, cooperation with States and private industry, and research.

THE NATIONAL FORESTS

In 1905, Congress transferred the national forests, which were called "forest reserves" at that time, to the Department of Agriculture from the Department of the Interior. Shortly after the transfer was made, the administering agency was named the "Forest Service." From this beginning, and under subsequent legislation, a system of management has been developed in the 50-year span which is predicated on the wise and coordinated or multiple use of all the resources on the national forests.

Today 149 national forests, comprising over 180 million acres of land in 38 States, Puerto Rico, and Alaska, are managed to serve all the people as sources of water, timber, forage, wildlife, and recreation. Local communities depend upon national-forest resources. Entire States, regions, and the Nation as a whole benefit from the stabilizing effect of their sustained production. This is especially true of the wide geographic variance in water production and its ultimate use.

Administration of the national forests provides for management of each resource for sustained production, for use and benefit of people dependent upon it, and for the correlation of all uses. This includes protection of the resources from insects, diseases, fire, and other damaging agents.

Timber Management An Important Job

Eighty-five million acres of national-forest land are classed as forest land available for commercial timber production. This is about one-sixth of the commercial forest land in the United States and coastal Alaska.

The national forests support 765 billion board-feet of sawtimber, more than one-third of the Nation's present sawtimber stand. Under good forestry practices the allowable annual cut was estimated to be nearly 9 billion board-feet. Almost one-third of this cut could not be made. Factors were inaccessibility, lack of technical personnel to prepare for and administer timber sales, and lack of adequate markets for low-value hardwoods and certain classes of forest products for which demand is low.

Progress in Timber Access Road Program

To make more national-forest timber available to purchasers, the Forest Service is building timber access roads. From 1940 through 1954, 5,482 miles of such roads were constructed. During 1955 an additional 529 miles were constructed or reconstructed, making a total of 6,011 miles.

In some sales, purchasers of national-forest timber construct or reconstruct timber access roads necessary for their operations. Expenditures by timber purchasers for access roads are taken into consideration by the Forest Service when determination is made, through appraisal, of the price at which the timber will be offered for sale. From 1940 through 1954, timber purchasers built, or improved under this plan, 8,785 miles of roads. In 1955 they constructed or reconstructed 1,632 miles, making a total of 10,417 miles.

It is planned to construct 700 miles of timber access roads by the Forest Service in 1956 and 2,000 by timber purchasers. Of the almost 120,000 miles of roads in the national-forest system, an estimated 50,000 are for timber access. About half of these should be improved or reconstructed, and at least 30,000 additional miles of new roads for this purpose are needed. Many other general purpose roads in the national-forest system are used to some extent in the harvest of timber.

Record Cut of Timber

In 1955 the national forests produced a record timber cut of 6.33 billion board-feet, which is the equivalent of about 15 percent of the lumber produced in the United States. In all, 27,542 sales were prepared and administered, with 21,618 of them for $2,000 worth of timber or less. Receipts for 1955 for timber totaled $73,187,364. Many mills, both large and small, depend primarily for continued operation on a steady supply of timber from national-forest land.

In 1955, a 3-year timber inventory project was started in Colorado, involving 9 million acres of national-forest land, 5 million acres of which are of commercial forest land classification. The inventory, based on both dead and green timber, will supply information upon which to base plans for developing use of pulpwood, sawtimber, and other products and will provide information for inquirers interested in possible establishment of wood-using industries in the State.

A survey completed on national-forest lands in southwestern Idaho in 1955 has compiled new information on amounts and species of timber available. As a result the allowable cut of national-forest timber has been increased substantially and will help alleviate the problem of excess mill capacity in that area.

Interest in Alaska's national-forest timber stands is growing. A preliminary award of 7.5 billion board-feet was made in the Juneau area. The awardee plans to open a newsprint plant. The sale contract, as elsewhere on the national forests, provides for safeguards to protect spawning streams, wildlife habitat, scenic and other resource values in the logging areas. Harvesting the tim-

ber is correlated with all other resource uses, under sound conservation principles.

Work was underway for an early sale offering of from 4 to 6 billion board-feet in the Sitka area. A pulpwood sale was made in the Wrangell area for 3 billion board-feet. The purchaser has planned a sawmill, plywood mill, and a small pulp mill for processing the timber.

In addition to the activities involved in preparing for and administering timber sales on the national forests, work was continued during 1955 on timber-stand improvement and in putting unproductive timber lands into production through planting.

The 12 Forest Service nurseries produced about 88 million seedlings and transplants. Of these, 37 million trees were planted on 55,637 acres of national-forest land, and of this total, 41,800 acres were timber sale areas where planting was financed from deposits made by timber purchasers for this purpose. The remaining 51 million trees raised in Forest Service nurseries went to other Federal agencies and to States under cooperative agreements.

A backlog of over 4 million acres of poorly stocked or nonstocked areas on the national forests are still in need of planting. Present rate of planting should be accelerated to take care of the backlog as well as the recurring planting needs on timber sale and burned areas.

Seedbed preparation was completed on 75,600 acres of national-forest land; thinning, removal of weed trees, disease control (except blister rust), and other timber-stand improvement on 528,239 acres; pruning to increase the value of crop trees on 135,300 acres; control of animals, mostly hogs, on 293,300 acres and rodent control on 22,450 acres.

A major overhaul of the standard Forest Service timber sale contract was completed. In the process it was given critical review by Forest Service field officers, by the timber industry, and by other interested parties. This instrument is now in full use.

A review draft of the Forest Service timber appraisal manual was completed in 1955. It is now being reviewed by key field officers of the Forest Service, by members of the timber industry, and by other interested people. This manual will be a valuable tool in obtaining uniform appraisals, in developing better understanding of Forest Service appraisal methods, and in providing a valuable reference for general timber appraisal work.

The urgent need for modern timber inventories of many national-forest working circles will be met within 6 to 7 years by a timber survey program which was greatly expanded beginning in 1955. Recent surveys have indicated that the allowable cut can be increased substantially as a result of better utilization and greater areas of operability.

Forest Pests Troublesome

Forest insects and diseases are responsible for great damage to timber stands and related values.

Insects are controlled by direct methods and through logging of infested timber where this is practical. In Montana, it is felt that the spruce bark beetle infestation is nearing control. In Colorado, the spruce bark beetle infestation, which has been a major one, is being controlled with mop-up of isolated spots planned for 1956. On this project, about 20 percent of the infested trees were removed by logging, and chemical control was applied to the rest. Salvage of the dead timber is progressing. The southern pine beetles have been troublesome in Mississippi, Alabama, North Carolina, Tennessee, and to a lesser extent in other Southern States. A combination of logging and chemical control is being applied in this section.

The spruce budworm, which threatened timber stands in Idaho, Montana, New Mexico, and Oregon, was treated by aerial spraying in 1955. Work was accomplished in cooperation with States, private owners, and other Federal agencies. A total of 2,235,000 acres was sprayed with outstanding success. From a background of research and experience, precautions are followed in the spray program to prevent or keep to a minimum any damage to the wildlife resource.

In addition, numerous smaller forest pest control projects were accomplished throughout the national forests during the year. Although these problem areas are smaller, early control is very important in preventing more serious epidemics with greater losses.

Water—One of the National Forests' Most Valuable Crops

Watershed management is inseparably tied to all resource use because of the component parts of a watershed: the soil, plants, grass, trees, and the water itself. Water produced on national-forest areas at high elevation is of value at great distances from its source. In the 11 Western States, national forests, with only 21 percent of the area, yield about 53 percent of the total runoff.

Water from western national forests supplies domestic and industrial needs to around 1,800 communities, energizes 600 hydroelectric powerplants, and is the major support for 21 million acres of irrigated farmland.

The effect of water on a watershed is tremendous. Where precipitation is 24 inches a year, quite typical of western mountain watersheds, a 100-square-foot area receives 6¼ tons of water each year. A 200,000-acre watershed receives over 544 million tons of water every year. This impact of water, which an area receives and discharges year after year, has continued down through the centuries and emphasizes the need for correlating all resource use and occupancy of such land with watershed protection—for production of usable water, for prevention of soil loss and waste of water through overland flow, and for flood prevention.

An example of national forest-municipal watersheds which have been the objects of studies and

programs is a cooperative agreement with the city of Everett, Wash., covering the use of national-forest land which is part of the municipal watershed.

Another example of a municipal problem which has been under study for several years is the Corvallis, Oreg., watershed. The primary use of the land is for water production. Private logging operations were suspended in 1920. Within recent years a large volume of mature and overmature timber was uprooted by winter storms and heavy snows. A bark beetle infestation followed, creating a high fire hazard—a menace to the watershed. The city of Corvallis worked with the Forest Service to plan a program which includes a road system and salvage logging. Logging methods and road construction were planned for greatest protection to the watershed, and additional fire protection has been provided. Studies are continuing on this project to determine the effect of the logging on the functioning of the watershed.

A study made of the Oroville Reservoir, Feather River project, Calif., was the result of a cooperative agreement between the State and the Forest Service. The agreement provided that the study would determine the impact of the reservoir on the watershed, on the resources involved, and on the resource use. The State of California provided funds for the study. Also cooperating in the study were the State Forester and the Bureau of Land Management.

Refinement of instructions on erosion prevention and control that were applied on timber sale areas in the California and Southwestern Regions are producing results through increased water control and soil stabilization.

Managing National-Forest Rangelands for Best Use

Sixty-two million acres of national-forest land is adapted to and is used for grazing of domestic livestock. Most of it is valuable also as watershed land and on more than half of it timber is produced.

Under paid permit 1,115,286 cattle and horses and 2,825,073 sheep were grazed. An additional 31,888 cattle and horses and 4,689 sheep were allowed to graze without charge. These 4 million head of livestock plus their offspring depend upon national-forest forage for a part of their yearlong supply of food. They contribute to local economies and to national production of meat, leather, and wool.

Receipts for grazing domestic livestock on national forests under permit in 1955 totaled $2,953,258.

One objective in national-forest range management is to maintain the highest productivity of the best quality forage that the range is capable of producing. As one means of achieving this, plans were prepared and studies started on a Service-wide method of analyzing grazing allotments. Range analysis has been completed on 824 out of 8,247 national-forest grazing allotments in the West.

Forage production and general range management were improved through seeding, chemical spraying of noxious plants to reduce competition, and installation of physical improvements such as fences, stock driveways, and water developments. In 1955 seeding was completed on 54,152 acres of national-forest land, bringing the total thus treated to 604,757 acres. Other range improvements include the following:

		Constructed in 1955	*Total to June 30, 1955*
Range fences	miles	148	29,002
Water developments	number	279	18,284
Stock driveways	miles	5	2,897

Equipment and methods developed through research are being applied on national-forest ranges to improve forage production. In some cases, range capacity has been increased from 2 to 20 times through seeding with adapted species. Spraying noxious plants has increased forage production from 3 to 5 times by releasing native grasses from competition.

Despite the progress that has been made, there is still much to be done before the national-forest range resource can be properly and effectively utilized. Many ranges are still in unsatisfactory condition or are deteriorating under too much use. On these the intensity of grazing must be balanced with safe grazing capacity and management improved.

Up-to-date inventory and plans are needed on the majority of range allotments. Seeding is still needed on more than 3 million acres, and because of advancement in seeding techniques and the development of more effective machinery the area capable of treatment is increasing. Noxious plant control is needed on an estimated 2,400,000 acres, and poisonous plants should be controlled on an additional 420,000 acres. Rodents are a menace on about 2,800,000 acres of national-forest rangeland. To obtain the most efficient use of the forage crop and at the same time protect vital watersheds, timber crops, recreation areas, and other forest values, many miles of additional fence and a great many water developments are needed on the livestock allotments. The Forest Service is working with the livestock permittees to obtain many of these needed improvements.

National Forests Provide Wildlife Habitat

National forests furnish food and homes for an estimated 3,310,000 big-game animals that spend all or part of their time on these lands. In the management of this wildlife habitat, the Forest Service cooperates with States and other agencies involved in wildlife management. Proper utilization of the wildlife resource on a sustained

yield basis is encouraged through licensed hunting, fishing, and trapping under State laws and regulations.

One objective of wildlife management is to maintain populations at a level consistent with the requirements for other uses of the land. Increased emphasis has been placed on this phase of wildlife habitat management.

In 1955 hunters and fishermen made more than 11 million visits to the national forests and harvested 480,000 animals.

Numbers of small game have been maintained and some species, particularly wild turkey, are expanding their range on the national forests.

Cooperative planning of big-game hunts and revision of State laws have resulted in significant progress in obtaining fuller utilization of the game crop. As an example, several States allowed both or either-sex deer hunting for the first time in 1954 and 1955.

Other cooperative work with States includes studies of wildlife populations and habitat requirements; stream and lake improvement projects; construction and maintenance of hunter and fisherman access roads and trails; wildlife habitat improvement for big and small game species through food and cover plantings; water developments and clearings; maintenance of suitable habitat for nongame birds and animals.

Recreation Use on National Forests Increasing

A total of 45,700,000 visits for recreation were made to the national forests in 1955, an increase of 13 percent over 1954 and 67 percent over 1950 as follows:

Primary purpose:	*Number of Visits*	
	1950	*1955*
General enjoyment of forest environment	7,968,582	12,444,593
Picnicking	6,326,458	10,883,935
Fishing	4,885,321	8,278,348
Hunting	2,284,643	4,064,062
Winter sports	1,516,585	2,769,584
Camping	1,534,108	2,723,560
Swimming	902,172	1,368,120
Hiking and riding	634,645	1,053,526
Organization camping, canoeing, scientific study and hobbies, wilderness travel, etc.	1,315,283	2,127,140
Total	27,367,797	45,712,868

The 1955 use totaled 62,000,000 man-days. Recreation interests of these national-forest visitors included picnicking, hunting, fishing, camping, hiking and riding, swimming and skiing, trips into wilderness areas, weekends or summers at cabins or resorts.

Recreation use of the national forests increased from 27 million visits in 1950 to almost 46 million in 1955, an increase which is greater percentagewise and in actual numbers than the population increase in the United States during the same period. Use has outgrown the facilities available.

At any one time in 1955 national-forest campgrounds and picnic areas could properly accommodate 277,000 people. Actually many times that number came to these recreation spots throughout the season of use. The greatest impact of use came on weekends and holidays and at areas reasonably close to urban centers. At these times the total facilities were overtaxed and visitors were turned away.

Improvements at the areas—fireplaces or simple stoves, safe water supplies, facilities for sanitation—are provided to help prevent forest fires and water pollution and to insure public health and safety. When people, unable to find space at improved picnic areas or campgrounds, stop anywhere along a road or by a stream, the danger of forest fires and water pollution is greatly increased. Vandalism is a major problem in many national-forest recreation areas.

Congress granted an increase in funds in 1955 for sanitation and care of recreation areas to enable the Forest Service to correct some of the unsatisfactory conditions. The increase in number of recreation visitors kept ahead of the improvement that could be made.

In 1955 Squaw Valley, an area on national-forest and private land in California, was selected as the site for the 1960 Winter Olympics.

Three primitive areas were reclassified in 1955. The Thousand Lakes Primitive Area on the Lassen National Forest in California became a wild area. The Teton Primitive Area on the Teton National Forest in Wyoming and the Pecos Primitive Area on the Carson and Santa Fe National Forests in New Mexico became wilderness areas. In 1955 there were 50 primitive areas, 3 roadless areas, 10 wilderness areas, and 16 wild areas on national forests in the United States, a total of 79 areas of this type, totaling 13,795,075 acres.

Other Land Uses on the National Forests

In addition to the uses already described, other public, semipublic, and private uses of national-forest land are permitted. More than 55,000 permits cover such uses as telephone and transmission lines, water systems, reservoirs, municipal watersheds, resorts, stores, cabin sites, organization campsites, airports, radio and television sites. These permits resulted in receipts of $1,524,045 in 1955.

Under lease for the production of oil, gas, and certain other minerals were 7,221,307 acres of national-forest land.

Mining claims on national forests reached a peak of 200,000, covering 4½ million acres as of July 1, 1955. The uranium boom showed its effect in that claims were being filed at a rate of about 5,000 per month.

Public Law 167, 84th Congress (act of July 23, 1955), was one of the most important conservation measures affecting public lands that had been enacted in many years. It is concerned primarily

408206—56——2

with aboveground resources and goes a long way toward preventing abuses of the mining laws and interference between mining claims and the management of national-forest resources. At the same time the legitimate miner retains all of his mining rights. The Secretary of Agriculture authorized the Forest Service, as provided under the law, to dispose of common varieties of sand, stone, gravel, pumice, pumicite, and cinders on lands administered by this agency. These varieties are not considered valuable mineral deposits within the meaning of the law, and so are not open to location.

Immediately after Public Law 167 became effective, work was begun on preparing instructions for administering all phases of it, fieldwork plans were organized, and in-Service training conducted.

Fire Control on the National Forests

Prevention of man-caused fires has high priority in the overall fire-control picture on national forests. Another important objective is to detect all fires promptly and to bring every fire under control as rapidly, efficiently, and economically as possible.

The 1955 Season

There were fewer fires than average during 1955 in spite of the fact that, with the exception of the northwestern and northeastern parts of the United States, burning conditions were generally bad. In California occurrence of 17 major conflagrations during one 10-day period created the greatest peak suppression load experienced in many years. Twenty years ago nearly 20 percent of the forest fires on national forests reached a size of 100 acres or more. Now, because of improved fire equipment, faster action by air, improved fire-weather forecasting, greater skills, and other progress, less than 1 percent of the fires burn more than 100 acres. This small percentage of present-day fires, however, accounts for 86 percent of annual area burned.

Expanding Use of Aircraft in Fire Control

In the 1955 season, 14,047 airplane flights were made in 18,739 hours, helping to control fire by more rapid transportation of firefighters, overhead crews and supplies, and in scouting burning fires to facilitate effective attack. Helicopter use increased in 1955. They were particularly useful in transporting personnel and emergency supplies to remote areas, in scouting fires, and in getting prompt, initial attack. Delivery of supplies and tools to back-country fires by airplanes and helicopters is replacing many of the pack mule strings which spend hours or even days getting to remote areas.

The Smokejumpers in 1955

Smokejumpers, highly trained men who parachute to fires and form the first line of defense, made initial attack on 250 fires in remote areas. This action involved a total of 1,031 jumps, resulted in an estimated savings of $770,000 in fire suppression costs, and prevented 26,000 acres of burn. However, where transportation systems are reasonably well developed, attacks by ground crews are more effective.

Initial air attack on fires with both water and chemicals is proving beneficial in light fuels. Fire-retarding chemicals can slow down the spread of fire until ground forces reach the blaze and suppress it.

A total of 8,173 fires during 1955 burned 372,918 acres of national-forest and adjacent land, causing damage estimated at $32,172,473.

National-Forest Properties

Eighty-five percent of the present national-forest acreage was reserved from the public domain of the United States. The Weeks law, enacted in 1911, provided for establishment of national forests on watersheds of navigable streams. Under this law, national forests in the eastern part of the United States were established. Areas and boundaries have been expanded or retracted in accordance with national policies and needs for land use and natural resource conservation. Present national forests are the result of this evolutionary process over more than a half-century.

Area and origin of national-forest and related land administered by the Forest Service, June 30, 1955, is as follows:

	Acres
Reserved public domain	154,228,329
Purchased for national-forest purposes	18,380,347
Acquired through exchange of public domain national-forest land and timber	5,579,636
Acquired through exchange of national-forest land and timber obtained by purchase, donation, or transfer	1,052,071
Donated	430,497
Transferred from other Federal agencies (except public domain)	1,331,368
Total	181,002,248

This figure includes 130,678 acres of experimental areas, and 128,669 acres of land utilization areas administered by the Forest Service prior to January 2, 1954.

Changes in acreage of national-forest land occur each year through additions, eliminations, surveys, adjustments, and recomputations. During fiscal year 1955 a net reduction of 55,370 acres occurred.

Increases:	*Acres*
Purchased	12,325
Conveyed to United States in exchange	39,874
Donated to United States	186
Transferred from other Federal agencies	1,261
Reserved from public domain	80
Recomputation and adjustments	31,629
Total	85,355

Reductions:	Acres
Conveyed by United States in exchange	29,528
Grants, sales, reconveyances, and mining patents	99,135
Transferred to other Federal agencies	10,730
Eliminated from national forests and returned to public domain status	1,163
Recomputations and adjustments	169
Total	140,725

Land Utilization Projects

By order of the Secretary of Agriculture, effective January 2, 1954, all or parts of 82 land utilization projects, totaling about 7,278,800 acres, were transferred from the Soil Conservation Service to the Forest Service for administration. Prior to that date, 1,523,400 acres in 40 such projects had been given national-forest status by proclamation, Executive order, or congressional acts, or had otherwise been assigned to the Forest Service.

The land utilization projects, also referred to as land adjustment demonstration or submarginal land projects, were acquired by the Federal Government during the period 1934 to 1942 for the purpose of bringing about desirable changes in the use of land in localities which were recognized as problem areas. Approximately 5½ million acres were in the Great Plains, including more than ¾ million acres in the Dust Bowl of the 1930's. About 1¼ million acres were in the Eastern States, primarily the Southeast, and the remainder was in the West. Although large parts of these projects were once in cultivation, over 6 million acres are now in grass and essentially all the rest is timberland. Through the years the Government has constructed recreational developments in key areas and made other capital expenditures to establish, protect, and develop the forage, timber, and other resources of these projects, in accordance with good conservation practices.

As of January 2, 1954, all or parts of certain projects totaling about 819,000 acres were under long-term lease (50 years or more) to non-Federal public agencies. Excluding these long-term leases, together with lands previously given national-forest status and areas permanently assigned to other departmental agencies for research or other purposes, there remained about 6,910,000 acres for which the Forest Service had administrative responsibility.

In 1954, the Secretary of Agriculture established a policy for disposition and management of these projects. In general, this policy provided that areas under long-term lease to the States and other public agencies should be conveyed to the leaseholders without cost. Remaining lands which were not transferred to the States, and which continued to be administered as title III lands, would be considered for transfer to other requesting Federal agencies if their intended uses were consistent with the conservation purposes of title III of the Bankhead-Jones Act, and if their needs appeared to outweigh the needs of States, or the Department of Agriculture. Lands not transferred to other Federal agencies, or selected for retention in the Department of Agriculture, would be offered for sale to statewide agencies with the requirement that they continue to be used for public purposes. Lands not selected for retention in Federal ownership, or sold to the States, would be classified as to their suitability for permanent private ownership and qualified lands would be offered for sale giving preference to current users. The new legislative authority necessary to implement this last step was first requested by the Department in July 1954 but has not yet been granted.

On June 30, 1955, a total of 7,048,111 acres remained in the land utilization projects. Federal agencies had indicated a need for about 1,637,500 acres and their requests were being studied. During 1955, the Secretary of Agriculture authorized the Forest Service to initiate negotiations with States for the sale of all or parts of 23 projects totaling about 470,000 acres.

In general, the Forest Service is continuing the management policies and practices that have been followed on these projects since they were acquired. Approximately 5 million acres are under short-term lease (10 years) to livestock grazing associations, soil conservation districts, and other local agencies. These leases require the application of measures and practices that will protect and develop the land and its resources. Major recreation developments are under lease to concessioners who pay the Government a fixed percentage of their gross annual income. On other projects, grassland is made available to local livestock owners under permits which regulate use in terms of available forage, while timber is marked and advertised and sold to private operators on the basis of competitive bidding.

Total income from land utilization projects during fiscal year 1955 was $1,618,410. Twenty-five percent of the receipts each year are returned to the counties in which these lands are located to be spent for schools and roads. These receipts came from the following sources:

Grazing	$806,967
Timber	309,295
Mineral leases	374,261
Haying, sale of seed, and cropping	65,713
Recreation	33,237
Other	28,937

The volume of business accounting for these receipts included 1,688,346 animal-months of grazing use by cattle and horses, 412,323 animal-months use by sheep, and a timber cut of over 23 million board-feet. Almost a million visits were made to land utilization projects in 1955 for recreation.

FOREST SERVICE COOPERATION IN STATE AND PRIVATE FORESTRY

The Weeks law of 1911 in addition to providing for establishment of national forests on watersheds of navigable streams also provided for cooperative forestry programs between Federal and State governments. That law and subsequent amendments and acts recognize the need for cooperation in protection and management of non-Federal lands. Cooperative efforts between the Forest Service and State governments have continued to improve over the years, with mutual benefits.

Cooperative Forest Management

Thirty-eight States were active in the cooperative forest management program. Pennsylvania, Montana, and Utah plan to enter the program during fiscal year 1956. Good cooperation with consulting foresters, industry foresters, and timber operators continued during 1955. State supervision and training of service foresters continued to improve as more States added staff supervisors to work in the program. Cooperation with County Agricultural Conservation Program Service offices expanded as more States assumed responsibility for checking compliance on ACPS forestry practices. Pulp companies cooperated with service foresters in better cutting practices on private lands.

Management of small forest properties is relatively recent. More than half the Nation's commercial forest land is in 4½ million small ownerships, 3.4 million of them on farms. A substantial amount, perhaps one-half of the Nation's timber cut, comes from these small woodlands with an average size of 58.8 acres. In fiscal year 1955, with 38 States participating, 34,828 owners, controlling 2,914,026 acres, were given assistance. They harvested 549,373,000 board-feet of products with a gross sale value of $11,756,517. Expenditures for technical forestry help totaled $1,919,294, of which $533,565 were Federal and $1,385,729 were State funds.

General Forestry Assistance

Several training schools were held in every State of the South to provide State, private, and consulting foresters with the latest information on hardwood utilization, log grades, and inventories. An investigation was made for private industry of the possibility of management of swamplands in the Southern Region.

In Vermont technical assistance in both timber inventory and management planning was provided to large forest-land owners.

The continuous forest inventory method, using punchcards, has been adopted by a growing number of large timberland owners. A conference held in Milwaukee to discuss this method and its uses was attended by 50 foresters from all over the United States and Canada. Twenty million acres are now being managed through this system.

Assistance was given to a large number of public and private agencies. Technical forestry assistance was provided in the agricultural conservation program. McNeil Island Federal Penitentiary was assisted in management and utilization of several thousand acres of Douglas-fir. Cooperation between the Forest Service and armed services in fire control and technical forestry fields were developed further throughout the Nation in 1955. The Corps of Engineers has sent to all Army installations an outline for woodland management plans, which was developed in cooperation with the Forest Service.

Cooperative Pest Control

Forest insect and disease control projects were submitted by several States through the regional offices to the Chief's office. The spruce budworm job in Maine was the first project under the Forest Pest Control Act to include only State and private lands.

A tabulation of State laws relating to forest pests was prepared and distributed to regional offices and States.

A tabulation of statistics relating to forest pest control on State and private lands was made. This covers activities under the Forest Pest Control Act from 1947 to 1954.

The Council of State Governments has a special committee to draft programs for suggested State legislation. The Forest Service suggested legislation for control of insects and diseases. It was approved by the Department, submitted to the drafting committee, and adopted by the council as part of its program. It was printed in 1955 and distributed to all States.

Working with the technical staff of the Forest Service, cooperating Federal, State, and local agencies performed white pine blister rust control work on 662,212 acres of non-Federal land in 1955. The disease is now under control on 17 million acres, which is 73 percent of the 23.3 million acres in the control area. Severe damage from blister rust is still taking place on unprotected and partially protected white pine stands. The situation is particularly critical in Idaho.

Cooperative projects were carried on in Pennsylvania and North Carolina to control oak wilt. The projects supplemented control of infected trees by logging.

Cooperative Tree Planting

One of the better known Federal-State cooperative activities in forestry is reforestation and windbarrier planting. The need for planting keeps ahead of the work accomplished in this field. About 52 million acres of poorly stocked or nonstocked commercial timberland, publicly and

privately owned, are in need of planting. Eighty-three percent of this is private land. In addition, planting is needed on 5½ million acres of non-commercial forest land and on 3 million acres for windbarriers—a total of a little more than 60 million acres. Less than 6 million acres in all ownerships have been successfully planted.

During the past year the Forest Service cooperated with 44 States, Hawaii, and Puerto Rico in the production and distribution of trees at low cost to farmers and other landowners. The 90 State nurseries produced 519,462,000 trees. In addition, private commercial, industry, and other non-Federal nurseries produced 112,481,000 trees and Federal nurseries produced 110,330,000 trees. Altogether this output planted 812,588 acres. Plantings under this cooperative program were on non-Federal public and privately owned land to rebuild poorly stocked or nonstocked forest land and abandoned farmland adapted to this purpose, and to speed the regeneration of newly cutover forests even though natural regeneration might be expected. The present demand for planting stock is greater than present production.

Watershed Protection and Flood Prevention

The Forest Service participated in watershed protection and flood prevention activities of the Department, which were increased by the enactment of Public Law 566, 83d Congress, on August 4, 1954. The Forest Service helped make 68 feasibility surveys. Of the 68 projects, 40 included State and private forest lands, 13 involved national-forest and associated rangelands, and the balance were found to have no forestry aspects. The Forest Service also participated in 49 of the 58 active projects in the watershed protection pilot program. Nine of these include national-forest land. An example of the value of land treatment under this program was shown on a project in New Mexico. Rains with intensities up to 3.3 inches per hour fell here. No flood flow came from the treated area, but from watersheds to the north and south, floods and debris spewed into the valley, causing more than a million dollars damage.

In addition to these small watershed projects, the Forest Service is participating with the Soil Conservation Service in 6 of the 11 larger watershed projects authorized by the Flood Control Act of 1944. Work on these projects has been in progress for almost 12 years. The Forest Service has worked either directly on national-forest lands or in cooperation with State Foresters on private land. To date, trees have been planted on 94,500 acres of eroding land, 260 miles of eroding road slopes stabilized, fire protection intensified on more than 4 million acres of forest and mountain watershed, and 135 stabilizing structures constructed in mountain-stream channels.

Seven emergency flood prevention projects involving national-forest land were completed. One in New Hampshire was the result of Hurricane Hazel. The other six, all in California, were on watersheds damaged by fire. Emergency treatment included seeding 16,700 acres of critical flood-source lands, constructing diversion ditches, stabilizing eroding logging roads, and cleaning debris from stream channels.

Cooperative Fire Control

The Forest Service cooperates with 44 States and Hawaii in protecting 387,156,000 acres of non-Federal forest lands from fire. Much of this area is within watersheds important far beyond the boundaries of the States in which they are located. State and private forest lands are the most productive and accessible in the United States. From them comes about 80 percent of the timber cut.

Still without organized protection are 43,953,000 acres of State and private forest land, although during 1955, 4.8 million acres were placed under protection. The importance of bringing more acreage under protection is emphasized by a comparison of the fires and acreage burned on protected versus unprotected land. In 1955, 11.3 percent of the State and private forest land, still without organized protection, was burned by 57,576 fires. Only 0.63 percent of the 378,156,000 acres of protected land was burned (2,448,191 acres and 80,774 fires). For every million acres of forest land, six times as many fires occurred, on the average, on unprotected land as on the protected land, and the former burned three times as much acreage per fire. More than two-thirds of the unprotected area is in the Southern States and potentially is highly productive.

An example of the cooperative efforts of Federal, State, and local governments and private industry in combating fires which spread over both national-forest and non-Federal land occurred in California during the 18-day period, August 27 through September 13, 1955. Burning conditions were hazardous. Twenty-one fires started on August 27, and by September 3, 206 had broken out. September 4 was the worst day with 70 new blazes to combat, and within the next 9 days, 160 more had occurred. Combined efforts of fire-fighting groups kept all except 41 of the fires down to less than 300 acres, but the 436 fires destroyed 141,222 acres of timberland and 165,891 acres of watershed land. Lightning was to blame for only 59 of the fires—377 were man caused. The Forest Service, California Division of Forestry, local fire departments and local governments, lumber companies, military forces, and others combined to make up a firefighting force of 18,400 men. They used 529 bulldozers, 919 tank trucks, and 57 aircraft, including 10 helicopters, in the fire-suppression job. Trained and experienced firefighting leaders came from every western State.

To achieve soil stabilization, immediate reseeding of the burned national-forest watershed lands was undertaken where practical.

The Southeastern Interstate Forest Fire Compact Commission, organized to include Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia, has been ratified by all States except Virginia.

A similar compact commission, known as the South Central, was organized to include Arkansas, Louisiana, Mississippi, Oklahoma, and Texas. This has been ratified by all five States.

These compact commissions are designed to correlate fire-control activities among States during periods of extreme emergency.

Cooperative Fire Prevention

Prevention of fire has always been a keystone of the cooperative forest protection effort, based on the fact that 9 out of 10 forest fires are man caused, and therefore preventable. The cooperative forest fire prevention program (Smokey Bear) continues to be highly successful. The Forest Service, State forestry departments, and The Advertising Council, Inc., combine to plan and execute this campaign each year. They are joined by conservation organizations and millions of private individuals to whom Smokey the Bear has become the symbol of being careful with fires in the woods. The movement has been productive. In 1942, when the Smokey Bear campaign started, 210,326 forest fires occurred on all types of land ownership. This was average for that period. The average number of forest fires for the period 1946–50 was cut to 190,000 in spite of greatly increased use of forest lands. In 1955 burning conditions and fire hazard generally were worse than average except in the northwestern and northeastern sections of the United States. Use of forest lands had increased, but the number of fires was reduced to 145,180. Area burned in 1942 on all forest and watershed lands was 32,333,398 acres; in 1955 it was less than one-fourth of that—8,068,601 acres. Improved techniques in detection and in controlling fires are responsible in part for the excellent progress in this effort, but Smokey Bear, the cooperative forest fire prevention program, and local "Keep Green" programs deserve a large share of the credit for the many man-caused fires that did not start but which might have burned considerable acreage.

FOREST RESEARCH

As forestry becomes more intensive, research becomes more and more important. Authorized by the McSweeney-McNary Act of 1928, forest research is centered in the Forest Service by the Secretary of Agriculture. Emphasized is research on timber growing, the effect, behavior, and control of forest fire, production of range forage for livestock and game on forest and related ranges, uses of forest products, watershed management, forest insects and disease, and forest economics. The research program is carried out largely at nine regional forest and range experiment stations, at the Forest Products Laboratory in Madison, Wis., and at research units in southeast Alaska and Puerto Rico. In its research, the Forest Service, acting for the Secretary of Agriculture, has authority to cooperate with individuals and public and private agencies, organizations, and institutions. Such cooperation continues to expand. Research results are currently made available to the public.

Forest Management Research

The aim of forest management research is increased forest production. Research plans to accomplish this by developing superior trees, by devising more certain planting techniques, and by developing better methods of managing and harvesting the forest crop.

Forest Tree Improvement

Selection and breeding of superior forest trees is an important part of forest management research. This work, underway on a small scale for a number of years, was expanded in 1955. Today, projects are underway in most of the major forest regions, aimed at developing improved trees. In California, a hybrid of three species of pine, Jeffrey pine, Coulter pine, and ponderosa pine, has been subjected to further testing and gives promise of being a desirable type of new tree for faster growth and resistance to pests. In Florida, tests have demonstrated that a tendency for high yields of naval stores gum is an inherited characteristic. Based on these findings plantations of trees with high gum yields can be established. The discovery in Idaho and in Florida that self-pollinated pine seedlings are smaller than cross-pollinated seedlings emphasizes the need for proper spacing and arrangement of trees in establishing seed orchards and harvesting timber by the seed-tree method.

Better Planting Methods

The publication of Agriculture Monograph No. 18, Planting the Southern Pines, summarizes about three decades of research and experience on planting the southern pines. This monograph brings together practical information from the collection and handling of tree seed, nursery practices, and methods of planting, to plantation care and protection.

For better selection of planting sites on lands stripped for coal, a simple chemical test was devised to detect excessively high sulfide contents in the overburden. Oxidation of the sulfides can create highly acid and toxic conditions. The new test, developed in cooperation with the Southern Illinois University, will help show landowners where planting success is more certain and thus result in savings in the rehabilitation of strip-mined coal lands.

Some types of undesirable brush or trees, which make planting difficult or slow down the growth of planted trees, can be controlled by aerial spraying. In Oregon, for example, spraying from the air controlled brush at a cost of $2.77 per acre, and in the Lake States, aerial application of spray deadened scrub oak at a cost of $5 per acre.

Naval Stores Production

A new bark-chipping technique, coupled with acid treatment and the use of spiral gutters and removable nails, can save the naval stores operator an estimated $4,125 per "crop" of trees. Former practices led to the waste of the turpentine section of the tree because of its high pitch content and prevalence of nails. With the new techniques, objectionable hardware is removed and the resin content of the wood is within acceptable limits for lumber or pulp.

Managing Northern Hardwoods

Guidelines for the management of northern hardwood forests were set forth in U. S. D. A. Technical Bulletin 1076. How to favor desirable species like sugar maple and yellow birch and the number of trees of different sizes to be carried as growing stock for optimum production were some of the topics pointing out how to obtain better forest practices in this forest type.

Watershed Management Research

Hubbard Brook Experimental Forest, established in the White Mountains of New Hampshire especially for watershed studies, offers the opportunity to apply soil-forest-water conservation principles and practices to highly important water-source areas and thereby increase basic knowledge. The White Mountains are the headwaters of the Merrimac, Saco, and Androscoggin Rivers, and part of the Connecticut River. These are the main sources of New England's industrial and domestic water and hydroelectric power. They are also the main flood-producing rivers of the region.

Observations and studies have been made on the effects of cutting and logging on soil and water relations. In Ohio clear cutting oak stands markedly reduced transpiration and thus increased moisture in the soil. But surface runoff per storm was 4 to 5 times greater from the clear-cut plots than from the uncut plots.

An experimental watershed in central Utah which was long overgrazed for the purpose of this study, was rehabilitated by plowing, contour trenching, and reseeding. Quick initial effects have been produced. The increased ability of the freshly plowed and contour-trenched plots to hold water in the innumerable little depressions and openings on top of and below the surface, and the protection to the topsoil provided by the successful reseeding reduced soil losses from snowmelt runoff from 39.2 to only 0.3 cubic feet per acre.

Because adequate ground cover is so important in the management of the vital chaparral watersheds in southern California, how native plants survive the dry summer was studied. It was found that scrub oak roots often penetrate more than 20 feet deep, allowing the shrub to draw water from a greater depth than other native shrubs; it also transpires water more slowly. Coulter pine and hoary-leaf ceanothus use available soil moisture rapidly and when moisture is exhausted within their root zone, apparently survive on water stored in the plant. California buckwheat sheds its leaves as soon as available soil moisture is gone, but puts out new leaves when water is again available. These differences bear directly upon the choice of plants for stabilizing the soil or increasing water yields, as the case may be.

Forest Fire Research

"Operation Firestop," concluded in California this year, was aimed specifically at developing aids to combat mass fires and in pointing the way toward additional research needed. New chemical methods were tried, mass water drops from aircraft tested, the use of helicopters expanded, and other studies carried on. This cooperative field project pooled the interests and facilities of county, State, and Federal forest firefighting agencies, Civil Defense Administration, Department of Defense, and municipal fire departments.

The cloud inventory phase of the Forest Service's cooperative lightning study, Project Skyfire, continued actively in Montana, north Idaho, and California. Analysis of the summer's data indicated at least five distinct types of thunderstorms, each differing in origin and behavior, in fire-setting potentials, and in forecasting problems. The Munitalp Foundation added another man to the Skyfire staff, and by the year's end the Advisory Committee on Weather Control had expressed interest in possible future participation in the study.

Range Management Research

Methods were developed for reducing drought impact on Southwestern desert-grassland ranges. Utilization of 30 to 55 percent of the total herbage of the perennial grasses, depending on species, eliminated the necessity for reducing stocking rates during slight droughts. During moderate drought, grazing capacity was found to be about half of the long-time average; during severe drought, about 30 percent. To meet these variations, several alternative kinds of flexible livestock operations are recommended to attain proper range use and secure the greatest economic returns.

Moderate grazing of winter range by deer results in better forage production, lower winter mortality, and more harvestable deer. In Utah, cooperative studies found herd losses to be closely related to amount of green forage available for

the deer at the start of winter. Where stocking of deer was high, and available forage low, starvation took many more deer than were harvested by hunters. Higher income, improved forage production, and better watershed protection resulted from moderate grazing in Colorado. The customary practice of grazing off 50 percent or more of the grass herbage on ponderosa pine-bunchgrass ranges progressively depleted the vegetation and in the sixth and seventh years gave a net return from cattle gains of only $473 per section, reduced water infiltration by one-half, and doubled the erosion rate in comparison with two lower rates of grazing. In contrast, 35 to 40 percent forage removal by moderate grazing improved the vegetation, gave an average return of $864 per section, and reduced infiltration only slightly.

Forest Insect Research

Forest insect research is strengthened.—Research on bark beetles and aerial survey methods both in the East and West were materially strengthened as a result of increases in funds provided by Congress.

Aerial application of a virus spray controls a forest insect infestation.—For the first time, direct control of a forest insect infestation was obtained by the aerial application of a virus spray. Practically complete control of an infestation of the European pine sawfly on red pine resulted from the aerial application of a virus spray at the rate of 2 gallons of virus suspension per acre. The virus, which is not native to this country, acts specifically on this particular sawfly.

Benzene hexachloride is useful in controlling the southern pine beetle.—Recent studies have shown that a spray containing benzene hexachloride in fuel oil is equally effective and cheaper to apply for control of the southern pine beetle than a spray of orthodichlorobenzene in fuel oil. In the past, the latter spray has been used in control programs in the South.

Aerial photographs are useful in evaluating mortality caused by Douglas-fir bark beetle.—A method has been developed for combining photo-interpretation with field checking to evaluate epidemic mortality caused by the Douglas-fir bark beetle. The method costs about half as much as a field survey of comparable accuracy. Color photography, although more costly, was more efficient than black and white.

A Jeffrey-Coulter pine hybrid is resistant to the pine reproduction weevil.—In 1948, three experimental plantings of a Jeffrey-Coulter pine hybrid were made on the Lassen and Shasta National Forests to test its resistance to the pine reproduction weevil. Results to date show the hybrid to be highly resistant to the insect under field conditions.

DDT in fuel oil is effective as a termite soil poison.—Inspection of tests in Mississippi show that 8 percent DDT in No. 2 fuel oil, applied at the rate of 1 quart per cubic foot of soil, has been 90 percent effective in preventing penetration of the soil by subterranean termites for a period of 11 years.

Forest Disease Research

Forest diseases are responsible for substantial losses in timber growth and in mortality. In California one-fifth of the gross volume of commercial timber, 95 billion board-feet, is cull from decay. In the Intermountain region commandra blister rust is causing severe loss in lodgepole pine. Surveys in Arizona and Colorado show that dwarf mistletoe infects more than half the commercial acreage. In the Lake States, many stands of aspen are practically ruined by Hypoxylon canker before they reach merchantable size. At present the most promising approach to control is through maintenance of high stand density and uniform spacing.

Research findings prevented a forced abandonment of the Ashe nursery in Mississippi, capable of producing upwards of 25 million trees annually and having a replacement cost of at least $250,000. It was found that root rots and poor soil conditions, which were damaging seedlings, could be overcome by soil fumigants and the addition of organic and inorganic fertilizers. The treatment had little net effect on the cost of production of the seedlings yet permitted doubling production by changing the rotation from 2 years to 1 year of cover crop between seedling crops.

In all regions east of the Mississippi River, soil covers, such as roll roofing, were effective in reducing moisture and controlling decay in wooden timbers in houses without basements.

Common molds that occur on logs, poles, posts, and lumber, which discolor but do not themselves rot wood, are now known to penetrate deeply into the sapwood and greatly increase the permeability to liquids. Moldy wood absorbs 4 to 6 times as much solution as uninfected wood. Unprotected and exposed to the elements, it absorbs rainwater rapidly, which favors decay by other fungi and rapid swelling and shrinking leading to open joints in wooden structures. On the other hand, moldy wood absorbs preservative solutions in greater quantity and to greater depths than unmolded wood. These findings are being applied to protect wood in use.

Forest Products Research

Researchers in forest products, most of whom work at the Forest Products Laboratory, are investigating the chemistry, growth, and structure of wood and determining the technical properties of the hundreds of American wood species and their variations of quality. The studies and tests involve a great diversity of products and methods.

New Products and Additional Uses for Wood

One new product, whose full value is still to be ascertained, is a fiberboard that affords protection from all known chemical and biological warfare agents and, to some degree, from radiological agents. New products and additional uses for low-grade material have been developed, such as acoustical material from white-pocket Douglas-fir and good sulfate and groundwood pulps from pole-blighted western white pine. High-grade material for house siding and interior use can be produced from a low-grade lumber by overlaying it with resin-impregnated paper. Tests have shown that the stability of wooden die models essential in automobile manufacture can be greatly improved by use of a resin-impregnated wood called "impreg" developed by the Forest Products Laboratory.

Paints and Finishes for Houses

Paint blistering due to rainwater getting back of wood siding has been a troublesome problem. The water runs over the face of the siding and seeps up through the laps by capillarity. Dressing the back at the butt edge and back painting reduces the rate of water inflow, and dip treatment with a water repellant stopped capillary flow, thus minimizing possibilities of blistering.

Natural finishes for exterior woodwork are very popular even though they must be renewed more frequently than paint. A new publication, "Natural Wood Finishes for Exterior of Houses," describes various finishes that may be used including varnish, oils, and sealers.

Broadening the Raw-Material Base for Newsprint

An acceptable newsprint paper has been made from cottonwood groundwood as well as from a mixture of equal amounts of cottonwood and willow groundwood. This process could replace the softwood groundwood pulp that is ordinarily used in newsprint. The softwood groundwood usually constitutes 75 percent of the newsprint sheet. In a further effort to substitute hardwoods, newsprint paper was made having a total hardwood content of 90 percent by using cottonwood groundwood and either cottonwood semichemical, cold soda, or chemigroundwood pulps. These developments could serve both to create new outlets for our abundant hardwoods and to lessen our dependence on foreign pulp sources.

Cooperation With Military Agencies

A new manual on principles of and materials for crate construction has pointed the way toward increased savings for military agencies. Progress has been made on certain refinements in purifying nitrating pulp. Pilot plant work on production of glycerol from wood has progressed as far as a continuous pilot plant stage. Methods to protect aircraft carrier decking from decay have been worked out. Progress has been made on the development of laminated deck members to resist high impact and exhaust temperature of jet planes.

Forest Economics Research

The forest economics research program includes current surveys of the forest resource, forest resource analyses, market studies, and other studies of the economics of timber, range, and watershed management and utilization.

The nationwide forest survey is conducted continuously to determine the character and condition of forest land; the volume, quality, and location of standing timber; rates of timber growth and natural losses; the amount and kind of timber cut; and the country's prospective requirements for timber products. In 1955, 40 million acres were covered, 15 million acres for the first time in 13 States, 25 million acres resurveyed in 11 States. In addition, about a million acres were surveyed for the first time in southeastern Alaska. The total area covered to date by initial surveys is 490 million acres, or 75 percent of the total forest area. About 158 million acres remain to be surveyed, largely in the Rocky Mountains and the Northeast.

In California statistics for the whole State were made available for the first time. The total volume of standing sawtimber was 360 billion board-feet, of which 60 percent was Douglas-fir and true firs, 28 percent pines, 10 percent redwood, and 2 percent hardwoods. A similar report for New York showed that nearly half of the State was forest land and that annual growth exceeded cut. However, the surplus was in hardwoods and the supply of important softwoods was dwindling. A resurvey in Minnesota revealed that, while forest conditions were improving, softwood sawtimber was decreasing. In Louisiana, a resurvey showed that softwoods were increasing in volume while hardwoods were decreasing as a result of extensive bottomland clearing.

Studies of markets and possibilities for expanding use of local timber products were made in Kentucky and Iowa in cooperation with State forestry agencies. And in Minnesota the possibilities for developing new markets for low-grade hardwoods were appraised in a study of the wooden pallet industry.

Large quantities of pulpable wood exist in sawmill and logging residues in the Southeast. A comprehensive project is underway to determine how much of this wood can be economically salvaged and marketed. Methods for measuring such residues, equipment costs, and alternative uses of residues are being studied.

ADMINISTRATIVE MANAGEMENT AND FISCAL CONTROL

The Forest Service continued, through 1955, to work for greater efficiency of operation through work improvement methods, greater decentraliza-

tion, employee training, safety programs, and delegation of authority. Progress has been made although the workload has increased greatly.

Consolidations

In the interest of more effective and economical administration of the national forests and service to the people dependent upon them, several consolidations were made during 1955. Better transportation and communication systems are two of many factors which make it possible to consolidate units without sacrificing service to national-forest users.

The Harney National Forest in South Dakota was consolidated with the Black Hills; the Cabinet National Forest in Montana and Idaho was divided among the Kaniksu, the Kootenai, and the Lolo; the name of the Chelan National Forest in Washington was changed to the Okanogan; the Bellevue-Savanna National Forest in Illinois was returned to the Army.

Interforest boundary adjustments were effected between the Carson-Santa Fe; Colville-Kaniksu; Ashley-Uinta-Wasatch; Arapaho, Gunnison, Grand Mesa, Rio Grande, Routt, and San Isabel.

Personnel

Engaged in the execution of the three major responsibilities of the Forest Service—national-forest administration, cooperation in State and private forestry, and research—were 9,116 year-long and 9,314 temporary seasonal Forest Service employees, on June 30, 1955.

During 1955 a total of 96 employees retired optionally or because of reaching mandatory retirement age. Their average age was 62.5 years; the average years' service, 29. In addition to the optional and mandatory retirements, 39 employees retired for disability during 1955.

Training

Throughout the Service increased emphasis and training activity was directed toward improved administration and resource management. This was particularly timely in view of increased workloads in all activities.

Several hundred new employees received primary on-the-job training in the technical and administrative aspects of national-forest management, research, and State and private forestry relations.

Many specialized training projects were carried on in the field in 1955. Typical examples: Field training in avalanche control was held in the Wasatch National Forest in Utah—a technique developed by the Service as a public safeguard in national-forest winter sports areas. The Forest Products Laboratory at Madison, Wis., extended its instruction on new techniques in wood utilization and wood products research to Service employees and to interested individuals who go in large numbers each year to the Laboratory for such help.

During the year more than 100 foreign visitors, mostly from the underdeveloped countries, were provided training by the Forest Service, in forest, watershed, and range management, forest products, and related technical fields.

A successful Tropical Forestry short course under the auspices of the International Cooperation Administration and the Food and Agricultural Organization of the United Nations was carried on by the Forest Service Tropical Research Center in Puerto Rico. Twenty-five trainees participated in the 3 months' session.

Safety

Accident prevention efforts continue to pay off with a further decrease, Service-wide, in injury frequency rates. The rate in 1955 is close to the goal of not to exceed 9 injuries per million man-hours worked. A third of the national forests were injury free in 1955 in spite of increased workloads, especially in hazardous jobs.

Fiscal Control

Although there was an estimated 10-percent increase in workload in fiscal activities in the Forest Service during 1955, actual employment for this purpose was decreased. The reduction was accomplished by improved organization, methods, machinery, and individual productive efficiency.

Experiments were initiated in the centralization at the regional level of practically all fiscal and accounting operations and their performance by punchcard machinery.

Receipts from the national forests deposited to the forest reserve fund in fiscal year 1955 amounted to $77,664,667. Sources of the receipts were as follows:

Timber	$73,187,364
Grazing	2,953,258
Other land uses	1,524,045

Other receipts included $1,271,251 from national-forest lands that were within the indemnity limits of the grants to the Oregon & California Railroad Co. and $584,962 from the Tongass National Forest in Alaska, both of which were deposited in suspense pending proper distribution. Receipts from land utilization areas (title III of the Farm Tenant Act) totaled $1,618,410 and other miscellaneous receipts amounted to $560,822; $642,034 was deposited under cooperative agreements, making the total for all receipts and deposits $82,342,146.

Expenditures for the national-forest system and land utilization projects amounted to $74,647,903, of which $24,503,380 was capital investment and $50,144,523 covered operating expenses. The above expenditures balanced against receipts from national-forest resources and land utilization projects totaling $82,342,146 show that combined

actual and estimated receipts exceeded operating expenditures plus estimated depreciation by $18,015,623.

Expenditures on other programs for which the Forest Service is assigned administrative responsibility include $13,741,439 for State and private forestry programs and $7,798,178 for forest research activities. Details on cooperative deposits and other nonappropriated expenditures are given in tables 12 and 13, which list receipts by sources and expenditures by classes.

Under the forest reserve fund law of May 23, 1908, and amendments, 25 percent of the receipts, excepting some special allocations, is returned to the States and is allotted by the States to counties or parishes on the basis of national-forest acreage, for expenditure, as provided under State law, on schools and roads. A total of $19,916,640 was returned to the States and counties under the forest reserve fund and title III, Farm Tenant Act. An additional 10 percent of the base receipts, $7,753,873, was appropriated to the Forest Service for expenditure on roads and trails within the national forests.

TABLE 1.—*National forest and other lands administered by the Forest Service, as of June 30, 1955*

State	National forests	Land utilization projects	Other	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	620, 756	10, 777	661	632, 194
Arizona	11, 334, 319		52, 604	11, 386, 923
Arkansas	2, 360, 346	81, 288	1, 686	2, 443, 320
California	19, 948, 851	23, 472	4, 696	19, 977, 019
Colorado	13, 736, 596	636, 343		14, 372, 939
Florida	1, 074, 441	117, 656		1, 192, 097
Georgia	665, 571	116, 663		782, 234
Idaho	20, 276, 281	49, 776		20, 326, 057
Illinois	210, 846			210, 846
Indiana	116, 164	3, 180		119, 344
Iowa	4, 749			4, 749
Kansas		106, 403		106, 403
Kentucky	457, 247			457, 247
Louisiana	560, 543	31, 157		591, 700
Maine	45, 862	465	3, 694	50, 021
Maryland		1, 110		1, 110
Massachusetts			1, 651	1, 651
Michigan	2, 539, 285	7, 802		2, 547, 087
Minnesota	2, 717, 987			2, 717, 987
Mississippi	1, 047, 023	87, 025	1, 211	1, 135, 259
Missouri	1, 359, 289	12, 938		1, 372, 227
Montana	16, 609, 160	1, 935, 391		18, 544, 551
Nebraska	206, 082	133, 634		339, 716
Nevada	5, 057, 490			5, 057, 490
New Hampshire	676, 878			676, 878
New Mexico	8, 611, 339	740, 911	8, 840	9, 361, 090
New York		13, 747		13, 747
North Carolina	1, 113, 831	14, 062		1, 127, 893
North Dakota	520	1, 103, 351		1, 103, 871
Ohio	103, 590			103, 590
Oklahoma	180, 977	81, 287		262, 264
Oregon	14, 819, 518	106, 025		14, 925, 543
Pennsylvania	470, 268	1, 760		472, 028
South Carolina	587, 332			587, 332
South Dakota	1, 119, 444	869, 139		1, 988, 583
Tennessee	583, 589	1, 212		584, 801
Texas	658, 024	124, 795		782, 819
Utah	7, 800, 579	60, 453	55, 625	7, 916, 657
Vermont	228, 621			228, 621
Virginia	1, 442, 097	2, 683		1, 444, 780
Washington	9, 688, 505			9, 688, 505
West Virginia	903, 559			903, 559
Wisconsin	1, 464, 037		10	1, 464, 047
Wyoming	8, 567, 188	573, 579		9, 140, 767
Alaska	20, 741, 076			20, 741, 076
Puerto Rico	33, 041	27		33, 068
Total	180, 742, 901	7, 048, 111	130, 678	187, 921, 690

TABLE 2.—*Area of commercial timberland and volume of sawtimber and growing stock in the national forests, as of January 1, 1953*

State	Commercial forest land	Sawtimber volume	Growing stock volume [1]	State	Commercial forest land	Sawtimber volume	Growing stock volume [1]
	Thousand acres	*Million board-feet*	*Million cubic feet*		*Thousand acres*	*Million board-feet*	*Million cubic feet*
Alabama	614	1, 512	404	Nevada	30	87	38
Arizona	2, 201	14, 276	2, 727	New Hampshire	580	1, 661	751
Arkansas	2, 326	4, 655	1, 340	New Mexico	2, 993	8, 620	1, 990
California	8, 573	178, 913	32, 086	North Carolina	999	2, 566	708
Colorado	6, 262	22, 032	6, 570	Ohio	88	187	57
Florida	1, 035	1, 344	525	Oklahoma	180	380	95
Georgia	641	1, 577	464	Oregon	11, 435	196, 278	36, 825
Idaho	9, 174	63, 220	14, 284	Pennsylvania	454	445	245
Illinois	184	468	122	South Carolina	524	1, 400	472
Indiana	112	153	50	South Dakota	987	2, 641	1, 027
Iowa	3	1	1	Tennessee	566	1, 170	350
Kentucky	455	1, 420	380	Texas	655	2, 842	678
Louisiana	536	871	266	Utah	1, 865	5, 461	1, 407
Maine	51	110	49	Vermont	191	539	238
Maryland	4	8	--------	Virginia	1, 260	2, 292	781
Michigan	2, 343	2, 100	1, 119	Washington	5, 674	112, 629	22, 869
Minnesota	2, 195	2, 433	1, 367	West Virginia	881	1, 238	658
Mississippi	1, 036	2, 607	661	Wisconsin	1, 357	1, 119	713
Missouri	1, 339	1, 212	504	Wyoming	2, 542	9, 420	3, 150
Montana	8, 939	32, 954	9, 941				
Nebraska	30	10	48	Alaska	3, 445	82, 524	17, 139
				Total	84, 759	765, 375	163, 099

[1] Includes sawtimber volume.

TABLE 3.—*Volume and value of timber cut from the national forests, and area planted and seeded to trees, fiscal year 1955*

State	Timber cut		Area planted and seeded to trees	
	Volume	Value	Fiscal year 1955	Total to June 30, 1955
	Thousand board-feet	*Dollars*	*Acres*	*Acres*
Alabama	56, 619	783, 227	634	44, 532
Arizona	192, 085	1, 562, 303	262	2, 354
Arkansas	104, 273	2, 273, 817	834	15, 957
California	840, 822	10, 000, 885	3, 083	54, 085
Colorado	153, 123	691, 456	121	68, 193
Florida	51, 389	483, 893	1, 930	14, 596
Georgia	33, 178	624, 140	1, 568	5, 793
Idaho	516, 745	3, 705, 799	787	101, 891
Illinois	2, 715	32, 803	1, 605	38, 100
Indiana	657	5, 714	1, 302	16, 058
Kentucky	12, 318	147, 961	43	595
Louisiana	73, 651	725, 933	683	100, 202
Maine	1, 247	9, 944		67
Michigan	96, 878	688, 212	5, 641	547, 640
Minnesota	127, 137	557, 059	4, 042	136, 549
Mississippi	98, 818	1, 366, 913	1, 340	141, 898
Missouri	27, 205	192, 996	988	65, 420
Montana	471, 453	2, 137, 663	1, 476	38, 289
Nebraska	24	247		29, 974
Nevada	190	695	63	167
New Hampshire	11, 107	113, 010		1, 153
New Mexico	87, 097	559, 865	202	2, 397
North Carolina	44, 813	506, 462	1, 314	8, 262
Ohio	1, 756	11, 404	988	10, 542
Oklahoma	6, 388	69, 844		57
Oregon	1, 767, 852	25, 187, 888	12, 429	94, 705
Pennsylvania	12, 922	187, 133	147	17, 251
South Carolina	41, 054	947, 762	233	17, 937
South Dakota	23, 298	169, 280	966	31, 543
Tennessee	19, 045	329, 984	1, 337	5, 217
Texas	116, 207	2, 252, 781	41	49, 005
Utah	37, 964	230, 918	15	4, 014
Vermont	7, 477	145, 963	4	1, 324
Virginia	27, 511	209, 376	679	3, 870
Washington	931, 645	12, 453, 383	9, 155	114, 749
West Virginia	20, 063	177, 795	63	15, 801
Wisconsin	58, 471	399, 286	1, 278	223, 390
Wyoming	70, 180	345, 196	259	7, 212
Alaska	182, 483	465, 664		
Puerto Rico	349	5, 716	125	12, 697
Total	[1] 6, 328, 229	[2] 70, 760, 440	55, 637	2, 043, 486

[1] Includes 20 M board-feet cut in New York; value of $70 included in total of next column.

[2] In addition, advance deposits of $2,426,924 were made in fiscal year 1955 for timber sold but not reported cut; therefore, receipts total $73,187,364.

TABLE 4.—*Number of livestock permitted to graze on the national forests, calendar year 1955*

State	Cattle and horses		Sheep and goats	
	Paid permits issued	Livestock	Paid permits issued	Livestock
	Number	*Number*	*Number*	*Number*
Alabama	5	1, 023		
Arizona	950	149, 312	26	83, 107
Arkansas	158	2, 559		
California	1, 216	106, 124	84	113, 809
Colorado	1, 855	153, 616	484	559, 279
Florida	19	2, 062		
Georgia	16	352		
Idaho	1, 969	114, 573	388	606, 830
Illinois	18	167		
Indiana	5	16		
Iowa	7	165		
Louisiana	52	1, 291		
Michigan	87	1, 088		275
Minnesota	29	303	1	18
Mississippi	136	2, 127		
Missouri	527	5, 719		
Montana	1, 785	118, 675	149	210, 017
Nebraska	53	12, 088		
Nevada	246	55, 277	44	145, 637
New Mexico	1, 845	78, 659	133	83, 749
North Carolina	16	167		
Ohio	26	87		
Oklahoma	4	19		
Oregon	899	74, 653	104	132, 860
Pennsylvania	4	13		
South Carolina	66	1, 441		
South Dakota	573	22, 160	18	11, 343
Tennessee	16	237		
Texas	172	1, 745		
Utah	3, 011	112, 006	640	469, 336
Vermont	9	100		
Virginia	10	128	5	196
Washington	478	21, 270	27	35, 608
West Virginia	69	1, 042	25	996
Wisconsin	25	282	1	45
Wyoming	1, 022	106, 615	201	376, 657
Alaska		13		
Total	17, 378	1, 147, 174	2, 330	2, 829, 762

TABLE 5.—*Estimated number of big-game animals on the national forests, as of June 30, 1955* [1]

State	Bear	White-tailed deer	Mule and black-tailed deer	Elk	Bighorn	Other [2]	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Alabama	5	4, 700					4, 700
Arizona	1, 100	15, 000	87, 000	9, 400	35	24, 300	136, 000
Arkansas	10	24, 000		200			24, 000
California	16, 000		577, 000	600	640	3, 600	598, 000
Colorado	8, 320		259, 000	40, 000	2, 800	390	311, 000
Florida	280	11, 000					11, 000
Georgia	50	6, 200					6, 200
Idaho	11, 050	28, 000	138, 000	59, 000	2, 600	12, 400	251, 000
Illinois		930					930
Indiana		550					550
Kentucky	5	1, 400					1, 400
Louisiana		2, 400					2, 400
Maine	20	500				5	520
Michigan	3, 000	171, 000				5	174, 000
Minnesota	3, 600	67, 000				640	72, 000
Mississippi		11, 000					11, 000
Missouri	5	31, 000					31, 000
Montana	8, 020	51, 000	146, 000	37, 000	1, 300	11, 500	255, 000
Nebraska		50	450				500
Nevada	50		94, 000	480	70	850	95, 000
New Hampshire	410	2, 200				15	2, 600
New Mexico	1, 300	5, 100	67, 000	2, 500	50	2, 560	79, 000
North Carolina	800	27, 000				300	28, 000
Ohio		950					950
Oklahoma		850					850
Oregon	8, 500	45	239, 000	33, 000		865	281, 000
Pennsylvania	320	47, 000					47, 000
South Carolina	5	3, 900					3, 900
South Dakota		75, 000	26, 000	100		750	102, 000
Tennessee	300	4, 600				650	5, 600
Texas		6, 200					6, 200
Utah	500		240, 000	5, 000	10	165	246, 000
Vermont	350	12, 000					12, 000
Virginia	1, 800	66, 000		100			68, 000
Washington	12, 020	14, 000	92, 000	20, 000		4, 805	143, 000
West Virginia	250	18, 000					18, 000
Wisconsin	1, 700	76, 000					78, 000
Wyoming	1, 980	10, 000	56, 000	39, 000	2, 100	5, 300	114, 000
Alaska	20, 200		54, 000	600	1, 400	11, 200	87, 000
Total	102, 900	794, 000	2, 076, 000	247, 000	11, 000	81, 400	3, 310, 000

[1] Figures rounded in posting and totals.
[2] Antelope, moose, mountain goat, peccary, and wild boar.

TABLE 6.—*Construction, reconstruction, and maintenance of national-forest (forest development) roads, bridges, and trails, fiscal year 1955* [1]

State	Roads		Bridges, construction, reconstruction, and replacement	Trails		Total obligations from all funds [2]
	Construction and reconstruction	Maintenance		Construction and reconstruction	Maintenance	
	Miles	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	3. 2	718. 1	3			115, 150
Arizona	53. 0	6, 053. 0	17		3, 675. 1	867, 375
Arkansas	19. 5	2, 697. 6	13			376, 017
California	55. 2	13, 541. 5	48	16. 5	16, 602. 9	4, 791, 728
Colorado	35. 3	2, 463. 6	64		9, 744. 9	866, 665
Florida	21. 5	1, 427. 7	4			165, 497
Georgia	7. 5	663. 9	2		182. 9	137, 615
Idaho	90. 1	7, 543. 0	122	9. 5	22, 958. 3	4, 735, 020
Illinois		140. 2				61, 883
Indiana	. 6	13. 8	1			11, 157
Kentucky	. 1	112. 8	1	2. 3	13. 5	123, 281
Louisiana	3. 1	649. 3	11			122, 756
Maine		14. 2			61. 0	2, 255
Michigan	14. 9	1, 341. 2	11			296, 132
Minnesota	6. 7	985. 1	8		471. 3	541, 199
Mississippi	38. 5	803. 8				211, 232
Missouri		690. 1				95, 303
Montana	111. 1	4, 833. 1	80	25. 7	17, 248. 8	1, 514, 762
Nebraska	1. 5	239. 5				7, 417
Nevada	28. 0	1, 137. 2	1		1, 739. 0	77, 713
New Hampshire		85. 2	1		729. 0	72, 801
New Mexico	5. 7	5, 176. 9	40		3, 596. 0	395, 763
North Carolina	2. 1	836. 4	11		1, 180. 5	241, 528
Ohio		1. 5				11, 642
Oklahoma	11. 5	177. 8				26, 973
Oregon	63. 6	9, 486. 3	65	51. 5	12, 872. 4	8, 819, 687
Pennsylvania	17. 0	182. 7	4		167. 8	195, 521
South Carolina	13. 1	732. 4	5			146, 975
South Dakota	16. 5	1, 170. 5	15		16. 6	172, 650
Tennessee	11. 3	591. 4	12		482. 5	105, 994
Texas	37. 2	717. 0				202, 486
Utah	12. 3	3, 001. 8	33		7, 339. 0	343, 724
Vermont	2. 1	83. 6	2		161. 0	83, 572
Virginia	2. 0	496. 1	8		806. 2	184, 888
Washington	20. 0	3, 515. 7	42	73. 8	10, 093. 1	2, 070, 998
West Virginia	4. 2	524. 9	12		767. 9	215, 581
Wisconsin	13. 8	943. 4	6			292, 730
Wyoming	33. 0	1, 909. 3	49	. 1	5, 866. 7	522, 739
Alaska	6. 5	67. 9	4	5. 0	622. 6	151, 196
Puerto Rico	5. 0	14. 6			20. 3	37, 984
Total	766. 7	75, 784. 1	695	184. 4	117, 419. 3	[3] 29, 413, 420

[1] Total mileage of existing and planned national-forest (forest development) roads and trails, as of June 30, 1955:

System:	*Roads (miles)*	*Trails (miles)*	*Total (miles)*
Existing	120, 914	118, 755	239, 669
Planned	40, 433	5, 907	46, 340
Total	161, 347	124, 662	286, 009

[2] Includes Bureau of Public Roads obligations against advances made to them by the Forest Service, but excludes unexpended advances.

[3] Adjusted.

TABLE 7.—*Use of recreation resources on the national forests, calendar year 1955* [1]

State	Number of visits to—								
	Camp-grounds	Picnic areas	Winter sports areas	Organi-zation camps	Hotels or resorts	Recreation residences	Wilder-ness areas	Other forest areas	Total
Alabama		44, 945		3, 500				57, 550	105, 995
Alaska (Terr.)	47, 930	40, 790	9, 614	1, 394	1, 970	15, 420		144, 590	261, 708
Arizona	296, 077	844, 046	10, 572	21, 990	181, 495	20, 045	9, 570	653, 491	2, 037, 286
Arkansas	42, 540	217, 515		23, 370	7, 500			469, 687	760, 612
California	1, 848, 084	1, 072, 684	1, 209, 962	202, 456	593, 641	392, 150	181, 699	2, 373, 992	7, 874, 668
Colorado	750, 783	1, 411, 585	276, 270	26, 425	1, 024, 760	48, 775	19, 000	1, 304, 510	4, 862, 108
Florida	35, 200	313, 700		32, 350	850	6, 520		272, 595	661, 215
Georgia	42, 500	300, 600		2, 400	600	2, 200		244, 700	593, 000
Idaho	347, 545	269, 980	160, 600	20, 094	75, 385	25, 066	18, 205	726, 243	1, 643, 118
Illinois	300	122, 000						178, 200	300, 500
Indiana	260	26, 200						62, 000	88, 460
Kentucky	2, 640	82, 060		300		1, 300		74, 490	160, 790
Louisiana		40, 000				8, 400		69, 000	117, 400
Maine	50	6, 000			400			18, 000	24, 450
Michigan	64, 500	224, 400	106, 000	10, 410	4, 300	2, 526		1, 679, 950	2, 092, 086
Minnesota	76, 760	79, 780	3, 840	7, 050	49, 060	18, 520	84, 190	427, 325	746, 525
Mississippi	3, 050	86, 985		21, 700				351, 135	462, 870
Missouri	12, 150	58, 600		1, 150	300	400		633, 320	705, 920
Montana	178, 968	273, 229	79, 850	20, 137	40, 860	70, 757	16, 710	662, 615	1, 343, 126
Nebraska		12, 893						3, 846	16, 739
Nevada	75, 260	93, 040	43, 300	5, 960		940		85, 120	303, 620
New Hampshire	44, 743	108, 789	64, 882		33, 053		100	694, 630	946, 197
New Mexico	154, 930	590, 080	33, 080	14, 350	7, 070	5, 760	7, 795	713, 230	1, 526, 295
North Carolina	336, 890	739, 060		8, 280	36, 350	1, 270	33, 000	807, 650	1, 962, 500
Ohio	5, 200	57, 100						71, 000	133, 300
Oklahoma		17, 000						5, 500	22, 500
Oregon	818, 675	595, 320	250, 600	48, 861	834, 090	41, 799	22, 320	611, 058	3, 222, 723
Pennsylvania	6, 000	90, 000		2, 500		10, 000		620, 750	729, 250
Puerto Rico (Comm.)	98, 750			5, 000	36, 000	12, 000		3, 000	154, 750
South Carolina	200	185, 720						83, 300	269, 220
South Dakota	94, 666	715, 886		8, 300	14, 240	17, 706		869, 451	1, 720, 249
Tennessee	31, 400	409, 100		16, 150	20, 600	23, 500		643, 365	1, 144, 115
Texas	4, 800	123, 500		2, 800				91, 000	222, 100
Utah	506, 255	1, 967, 805	289, 280	60, 332	71, 610	49, 190	18, 370	955, 350	3, 918, 192
Vermont	1, 300	54, 650	15, 000					22, 100	93, 050
Virginia	14, 804	194, 690		4, 635	80	490		319, 161	533, 860
Washington	564, 995	576, 540	324, 100	55, 581	121, 466	52, 901	4, 705	411, 430	2, 111, 718
West Virginia	12, 956	110, 950		4, 100				281, 800	409, 806
Wisconsin	24, 500	102, 750	48, 000	1, 325	130	1, 135		219, 000	396, 840
Wyoming	251, 045	158, 370	52, 270	22, 555	75, 050	34, 562	46, 430	393, 725	1, 034, 007
Total	6, 796, 706	12, 418, 342	2, 977, 220	655, 455	3, 230, 860	863, 332	462, 094	18, 308, 859	[2] 45,712,868

[1] In addition to the 45,712,868 visits to national-forest recreation areas, some 120 million visitors traveled highways and roads through the national forests in order to enjoy the natural forest environment, the scenery, and the climatic relief which the forests provide.

[2] For breakdown of primary purpose of visits, see tabulation in national-forest recreation section.

TABLE 8.—*Fires controlled by national-forest fire organizations to protect national-forest lands, and area burned, calendar year 1955*

State	Fires						Area burned	
	Lightning	Campfire	Smoker	Incendiary	Other causes	Total [1]	National-forest	Other ownership
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Acres*
Alabama	17	8	53	78	46	202	1, 104	1, 255
Arizona	490	103	100		42	735	25, 028	1, 273
Arkansas	55	11	37	40	45	188	589	183
California	921	71	267	37	223	1, 519	131, 254	53, 370
Colorado	97	63	71	1	29	261	1, 402	26
Florida	109	8	44	21	47	229	21, 422	2, 832
Georgia	2	2	19	9	18	50	265	771
Idaho	512	43	35		34	624	2, 849	6, 584
Illinois	1	4	18	4	29	56	254	580
Indiana			2		11	13	77	34
Kentucky		2	29	11	30	72	257	291
Louisiana	8	4	24	28	13	77	272	296
Michigan	16	16	69	4	75	180	335	367
Minnesota	10	36	35	6	39	126	117	341
Mississippi	7	15	59	233	50	364	2, 377	861
Missouri	10	13	59	100	163	345	761	480
Montana	307	38	35	1	51	432	2, 062	183
Nebraska	3					3	38	
Nevada	15	1	7		5	28	48	9
New Hampshire	5				2	7	1	
New Mexico	292	35	32	3	20	382	1, 285	300
North Carolina	5	7	31	31	48	122	58, 386	17, 195
Ohio		3	8	1	31	43	48	99
Oklahoma	7	2	1	9	4	23	85	12
Oregon	530	98	106		96	830	11, 991	4, 791
Pennsylvania			3		2	5	21	
South Carolina	3	6	57	91	69	226	5, 122	1, 976
South Dakota	69	4	5		17	95	6	2
Tennessee	4	6	11	85	29	135	1, 078	347
Texas	3	18	79	27	45	172	405	324
Utah	53	29	17	1	14	114	1, 019	328
Vermont	2			1		3	1	
Virginia	10		42	13	40	105	515	400
Washington	129	34	36		29	228	90	10
West Virginia		1	1		26	28	213	112
Wisconsin	1	2	13	2	8	26	6	10
Wyoming	70	21	15		10	116	5, 347	1, 136
Alaska		8			1	9	10	
Total	3, 763	712	1, 420	837	1, 441	[1] 8, 173	276, 140	96, 778

[1] Includes 5,660 fires on national-forest land and 2,513 on lands in other ownerships within and adjacent to the national forests.

TABLE 9.—*Forest fires on protected State and private lands, and area burned, calendar year 1955; and expenditures for control, fiscal year 1955* [1]

(CLARKE-M'NARY LAW, SEC. 2)

State	Area protected	Fires	Area burned	Prevention and suppression expenditures			
				Federal	State and county	Private	Total
	Thousand acres	*Number*	*Acres*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	19, 990	6, 909	208, 676	313, 704	805, 465	115, 058	1, 234, 227
Arkansas	16, 159	2, 376	32, 597	243, 402	724, 175	70, 482	1, 038, 059
California	19, 500	2, 070	209, 141	1, 366, 806	6, 530, 875		7, 897, 681
Colorado	7, 472	282	3, 601	25, 992	38, 941	32, 903	97, 836
Connecticut	1, 907	639	2, 210	42, 823	122, 040		164, 863
Delaware	440	63	380	9, 735	10, 416		20, 151
Florida	14, 929	8, 040	415, 468	512, 771	1, 285, 426	159, 342	1, 957, 539
Georgia	21, 361	10, 264	256, 445	505, 874	2, 130, 682	46, 249	2, 682, 805
Idaho	6, 963	315	7, 786	132, 416	156, 257	144, 161	432, 834
Illinois	3, 755	460	11, 277	25, 000	94, 733		119, 733
Indiana	4, 255	271	2, 951	48, 314	123, 845		172, 159
Iowa	1, 968	21	502	16, 956	16, 956		33, 912
Kentucky	6, 588	1, 315	34, 202	92, 683	254, 395		347, 078
Louisiana	11, 155	6, 600	100, 077	286, 997	1, 315, 253	9, 456	1, 611, 706
Maine	16, 692	490	1, 782	224, 310	569, 765		794, 075
Maryland	2, 686	371	1, 872	104, 686	362, 411		467, 097
Massachusetts	3, 293	3, 620	9, 223	107, 118	430, 041		537, 159
Michigan	17, 124	1, 289	7, 532	395, 208	1, 595, 140		1, 990, 348
Minnesota	17, 996	1, 065	38, 544	308, 596	589, 510		898, 106
Mississippi	12, 170	6, 935	103, 856	297, 813	804, 766		1, 102, 579
Missouri	8, 018	2, 033	24, 890	189, 698	496, 895		686, 593
Montana	6, 000	240	346	70, 017	84, 559	65, 492	220, 068
Nevada	2, 150	39	1, 512	25, 000	32, 008		57, 008
New Hampshire	4, 176	463	665	58, 173	154, 736	6, 705	219, 614
New Jersey	2, 294	1, 333	21, 460	90, 490	368, 243		458, 733
New Mexico	1, 360	44	157	16, 394	16, 394		32, 788
New York	13, 423	1, 720	23, 127	246, 395	786, 827		1, 033, 222
North Carolina	15, 697	3, 746	596, 382	295, 466	874, 169	34, 343	1, 203, 978
North Dakota	375	42	368				
Ohio	4, 973	635	2, 813	67, 136	194, 251		261, 387
Oklahoma	3, 591	523	29, 856	83, 549	166, 094	19, 178	268, 821
Oregon	11, 995	647	29, 690	591, 056	1, 145, 640	778, 185	2, 514, 881
Pennsylvania	14, 659	1, 259	33, 774	188, 506	469, 245		657, 751
Rhode Island	452	129	697	25, 000	113, 677		138, 677
South Carolina	11, 300	5, 179	131, 205	267, 241	906, 308		1, 173, 549
South Dakota	896	33	273	27, 000	34, 305	11, 582	72, 887
Tennessee	9, 544	2, 827	31, 521	204, 906	603, 832	4, 045	812, 783
Texas	8, 429	2, 174	24, 329	203, 730	517, 149	94, 543	815, 422
Utah	5, 721	64	997	25, 000	74, 598		99, 598
Vermont	3, 504	110	201	25, 000	47, 042	4, 339	76, 381
Virginia	12, 971	1, 506	15, 841	203, 822	550, 387	5, 216	759, 425
Washington	12, 329	736	1, 292	541, 227	1, 229, 041	501, 624	2, 271, 892
West Virginia	9, 038	991	24, 376	139, 931	164, 291		304, 222
Wisconsin	15, 590	899	3, 474	294, 644	1, 168, 558		1, 463, 202
Hawaii	1, 735	7	823	4, 500	8, 955		13, 455
Total	[2] 387, 156	80, 774	2, 448, 191	8, 945, 085	28, 168, 296	2, 102, 903	39, 216, 284

[1] Data incomplete for Arizona, Nebraska, and Wyoming.
[2] Includes 533,000 acres for Wyoming.

TABLE 10.—*Distribution of forest planting stock, and expenditures by cooperating States, fiscal year 1955*

(CLARKE-M'NARY LAW, JUNE 7, 1924, AS AMENDED)

State	Seedlings and transplants shipped	Expenditures			
		Matching Federal funds	State appropriated funds	Receipts from sale of stock used in program	Total
	Thousands	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	29, 131	11, 375	49, 411	59, 636	120, 422
Arkansas	16, 263	6, 850	6, 850	51, 034	64, 734
California	701	9, 500	29, 192	8, 585	47, 277
Colorado	468	2, 798	2, 798	11, 665	17, 261
Connecticut	919	7, 350	9, 117	21, 417	37, 884
Delaware	432	2, 675	7, 819	566	11, 060
Florida	40, 683	12, 625	44, 574	124, 766	181, 965
Georgia	112, 348	13, 025	76, 032	288, 141	377, 198
Hawaii [1]	151	9, 500	35, 943	----------	45, 443
Idaho	354	3, 317	3, 317	8, 975	15, 609
Illinois	6, 036	10, 890	71, 094	55, 991	137, 975
Indiana	7, 088	----------	57, 630	96, 241	153, 871
Iowa	441	9, 500	10, 094	6, 000	25, 594
Kentucky	4, 883	10, 650	30, 360	30, 177	71, 187
Louisiana	32, 456	10, 800	45, 387	99, 249	155, 436
Maine	795	2, 280	2, 350	11, 022	15, 652
Maryland	3, 645	10, 650	22, 428	171	33, 249
Massachusetts	604	10, 650	22, 589	15, 381	48, 620
Michigan	4, 861	10, 890	16, 612	48, 024	75, 526
Mississippi	22, 895	9, 500	77, 150	67, 579	154, 229
Missouri	1, 632	10, 890	13, 499	11, 366	35, 755
Montana	554	10, 946	10, 946	16, 221	38, 113
Nebraska	1, 338	1, 304	1, 304	40, 237	42, 845
New Hampshire	1, 123	10, 875	16, 736	6, 604	34, 215
New Jersey	1, 296	10, 650	16, 176	10, 651	37, 477
New York	38, 647	11, 445	249, 026	68, 022	328, 493
North Carolina	22, 565	12, 625	79, 482	58, 007	150, 184
North Dakota	1, 153	9, 500	18, 573	11, 251	39, 324
Ohio	9, 481	10, 890	91, 859	92, 686	195, 435
Oklahoma	1, 876	9, 500	14, 776	12, 046	36, 322
Oregon	5, 907	----------	3, 476	53, 918	57, 394
Pennsylvania	10, 671	10, 650	90, 688	69, 587	170, 925
Puerto Rico [2]	676	8, 000	30, 000	----------	38, 000
Rhode Island	102	4, 000	6, 094	1, 351	11, 445
South Carolina	34, 728	9, 500	14, 097	71, 957	95, 554
South Dakota	2, 297	7, 186	7, 186	66, 310	80, 682
Tennessee	12, 057	9, 500	11, 693	32, 503	53, 696
Texas	20, 513	6, 065	6, 231	67, 270	79, 566
Utah	133	4, 000	4, 175	3, 255	11, 430
Vermont	1, 373	10, 650	35, 000	10, 099	55, 749
Virginia	15, 489	9, 775	10, 256	59, 836	79, 867
Washington	490	4, 771	4, 771	6, 942	16, 484
West Virginia	2, 373	10, 650	11, 083	34, 296	56, 029
Wisconsin	24, 701	10, 890	186, 756	185, 211	382, 857
Wyoming	242	2, 365	2, 365	5, 990	10, 720
Total	496, 571	371, 452	1, 556, 995	2, 000, 306	3, 928, 753

[1] Territory.
[2] Commonwealth.

TABLE 11.—*Cooperative forest-management accomplishments and expenditures, fiscal year 1955*[1]

State	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M bd.-ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	396	50, 982	17, 631	425, 912	11, 918	11, 918	23, 836
Arkansas	221	36, 613	1, 462	23, 312	8, 000	17, 000	25, 000
California	781	106, 520	57, 696	394, 783	8, 500	55, 273	63, 773
Connecticut	730	15, 711	1, 777	38, 145	9, 900	19, 050	28, 950
Delaware	121	4, 241	839	23, 305	2, 550	3, 822	6, 372
Florida	1, 592	929, 489	26, 624	526, 563	21, 838	66, 607	88, 445
Georgia	707	150, 533	15, 681	365, 387	19, 400	42, 816	62, 216
Idaho	58	7, 133	865	25, 700	2, 722	2, 722	5, 444
Illinois	609	18, 493	3, 760	106, 162	23, 659	33, 169	56, 828
Indiana	455	15, 311	3, 026	91, 040	12, 670	26, 939	39, 609
Iowa	403	15, 380	1, 867	35, 597	8, 483	17, 074	25, 557
Kentucky	362	22, 742	3, 126	68, 417	16, 900	25, 795	42, 695
Louisiana	216	19, 309	2, 480	42, 549	13, 000	17, 264	30, 264
Maine	2, 376	73, 780	22, 423	690, 610	17, 875	49, 405	67, 280
Maryland	2, 038	32, 811	16, 703	300, 339	18, 200	51, 059	69, 259
Massachusetts	397	11, 642	17, 727	335, 945	5, 505	5, 576	11, 081
Michigan	801	16, 660	9, 819	258, 272	19, 037	70, 050	89, 087
Minnesota	541	11, 281	2, 111	49, 432	10, 200	21, 405	31, 605
Mississippi	630	66, 265	5, 698	126, 958	14, 121	15, 747	29, 868
Missouri	1, 342	177, 477	11, 199	351, 408	25, 566	58, 296	83, 862
New Hampshire	1, 300	64, 847	16, 549	342, 914	18, 172	24, 568	42, 740
New Jersey	433	50, 783	5, 402	66, 791	11, 700	26, 579	38, 279
New York	3, 925	285, 069	40, 367	898, 100	18, 434	158, 413	176, 847
North Carolina	778	67, 249	22, 056	579, 212	24, 900	37, 293	62, 193
North Dakota	27	512	206	13, 184	2, 750	3, 219	5, 969
Ohio	1, 396	44, 778	5, 548	179, 566	15, 468	80, 083	95, 551
Oklahoma	520	722	106	2, 706	4, 729	4, 729	9, 458
Oregon	680	31, 111	34, 753	802, 243	8, 412	18, 983	27, 395
Rhode Island	120	14, 608	9	175	2, 450	4, 514	6, 964
South Carolina	889	104, 109	11, 231	250, 329	18, 000	41, 433	59, 433
South Dakota			431	3, 446	114	114	228
Tennessee	528	42, 139	9, 377	219, 153	16, 500	17, 122	33, 622
Texas	775	65, 990	1, 342	25, 431	12, 000	16, 561	28, 561
Vermont	2, 731	65, 763	20, 819	531, 626	28, 550	72, 833	101, 383
Virginia	1, 987	162, 798	129, 607	2, 899, 858	29, 150	109, 652	138, 802
Washington	963	49, 312	16, 498	337, 954	11, 350	17, 854	29, 204
West Virginia	751	15, 204	4, 988	86, 099	18, 500	30, 124	48, 624
Wisconsin	2, 249	66, 659	7, 570	237, 894	22, 342	110, 668	133, 010
Total	34, 828	2, 914, 026	549, 373	11, 756, 517	533, 565	1, 385, 729	1, 919, 294

[1] Performed under authority of Cooperative Forest Management Act of Aug. 25, 1950.

POOR QUALITY

The following pages are scanned at the best possible quality setting. The original pages are of poor quality and this is the best possible reproduction.

...ceipts	Expenditures
[1]$82,342,146	$74,647,903
	7,155,588
730,152	642,590
730,152	7,798,178
...private forestry ...ms:	
...ation with States ...nder the Clarke-McNary law	10,676,405
	129,688
	474,935
	855,686
32,221	30,763
1,525,518	[2] 1,573,962
1,557,739	13,741,439
	[3] 393,707
8,743,591	5,631,995
3,912,825	2,770,395
[4] 4,657,786	4,285,071
17,314,202	13,081,168
101,944,239	109,268,688
	19,541,672
	[5] 374,968
	19,916,640
	129,185,328

[1] Excludes receipts for power licenses and mineral leases received by other agencies estimated at $1,780,000.
[2] Includes expenditures from prior-year deposits.
[3] Includes $360,000 made available in Forest Service appropriations for Interior and Indian lands.
[4] Does not include transfers of allotment in the amount of $106,000.
[5] Covers distribution against calendar year 1954 receipts.

TABLE 13.—*Statement of Forest Service receipts and expenditures for national-forest programs and land utilization projects, fiscal year 1955* [1]

Item	Receipts	Expenditures	
		Operating	Investment
National-forest protection and management and land utilization projects		$28,944,437	$2,502,751
Fighting forest fires		6,348,786	
Blister rust control		1,690,419	1,669
Forest pest control		4,005,919	17,519
Cooperative range improvements		267,145	144,143
Smokejumper facilities			20,927
Road and trail system, construction and maintenance		8,105,203	21,027,612
Acquisition of land		8,357	151,338
Flood prevention and watershed protection		135,601	622,907
Cooperative deposits	$642,034	638,656	
Development of ranger dwelling			14,514
National-forest and land utilization area receipts:			
Forest Reserve Fund	77,664,667		
Oregon & California Land (national forest)	1,271,251		
Tongass National Forest, Alaska (Suspense)	584,962		
Land Utilization Areas (Title III, Farm Tenant Act)	1,618,410		
Other miscellaneous	560,822		
Total	82,342,146	50,144,523	24,503,380

[1] Receipts by—

Forest Service	$82,342,146	
Federal Power Commission for power licenses (estimated)	530,000	
Interior for mineral leases on public domain national-forest lands (estimated)	1,250,000	
Total		$84,122,146
Operating expenditures	$50,144,523	
Estimated annual depreciation on roads trails and other improvements in place on June 30, 1954	15,962,000	
Total		66,106,523
Amount by which combined actual and estimated receipts exceed operating expenditures plus estimated depreciation		18,015,623

U. S. GOVERNMENT PRINTING OFFICE: 1956